the facts were obtained concerning the long retention of heat by the earth, to which I have already referred. Mr. Edwin Gilpin, Government Inspector of Mines, has kindly placed at my disposal what information he could gather on the subject, which I give, using, to some extent, the language of this careful and accurate observer. Mr. Gilpin has prepared a comparative view of sections of the same strata, made only a short distance apart, the design being to exhibit the changes made by igneous action.

The *present section* is taken at the new pit sunk by the Albion Mines Company on the burnt area; and what is termed the *original section* is one given in Sir William Logan's Report of the Geological Survey of Canada, 1869, p. 69. The distance between the localities where these two sections were made is so small that the comparison is at least instructive, and answers our purpose as well as anything that can be had.

PRESENT SECTION.	ft. in.	ORIGINAL SECTION.	ft. in.
Surface of burned clay	22. 0	Black, argillaceous shale, with many bands of iron-stone 1 to 2 inches thick. Total thickness 144 ft. 6 in.	2. 6
Band of hard scoriæ	4. 0	Brown carbonaceous shale	1.10
		Bad coal	0. 2
Reddish ashes	3. 0	Good coal	3. 7
Hardened shale	2. 0	Black shale with iron-stone bands	1. 2
Good coal (being upper part of the Deep Seam)		Good coal	3. 5
		Coarse coal	0. 8
		Good coal	3. 9
Depth of Pit	32. +	Coarse coal	0.11
		Good coal	3. 4
		Coarse coal	5.10
		Total thickness of the Deep Seam.	22.10

The surface cover consists of clay, with boulders of sandstone and layers of gravel. The small portion of the 144 feet of black argillaceous shale filled with iron-stone balls, passed through by the shaft, has been converted into an almost continuous mass of scoriæ, very hard and compact, and difficult to drill through.

The next layer represents the upper portion of the deep seam, which has been completely burned away, leaving a *compact, laminated reddish ash*. And it was in this ancient bank of ashes, known to be more than 300 years old, that the retention of heat was observed, which it is now my object to place on record. Immediately on opening the pit, the heat of the ashes, at a point 30 feet below the surface, was tested by a reliable thermometer, and was found to be 80° Fahr. at a time when the surface temperature varied from a minimum of 45° to a maximum of 65° Fahr.

Soon after an opening had been made through the pit to the workings in the mine, the air-currents caused the temperature rapidly to fall to the normal point.

The consideration of the gradual radiation of the heat of the earth suggests the idea that abnormal increases in the temperatures of deep mines may be due in some cases to the presence, at comparatively short distances, of masses of heated matter, which are, geologically speaking, modern, though they may be historically ancient.

RECOVERY OF OLD VULCANIZED CAOUTCHOUC.—The pieces are heated in contact with steam, when the sulphur is volatilized and the caoutchouc melts and is collected as a liquid, used in preparing water-proof covers, etc.

RADIOPHONY.—Professor Mugna, repeating M. Mercadier's experiments, in which an intermittent beam meets a smoked surface within a glass tube, containing aqueous or ammoniacal vapor, and furnished with an ear tube, adds to the effects by attaching a small microphone to an elastic membrane closing the tube. By this means he finds it possible to operate at a sufficient distance from the interrupting disc to render its noise no longer disturbing.

PILOCARPIN:—ITS ACTION IN CHANGING THE COLOR OF THE HUMAN HAIR.*

BY D. W. PRENTISS, M. D. Washington, D. C.

Pilocarpin is an alkoloid of Jaborandi and the active principle.

Jaborandi is a Brazilian drug recently introduced into medicine.

The leaves are the official part of the plant. (Pilocarpus Pennatifolius.)

The effect upon the human system is powerful and peculiar.

(It produces profuse sweating and salivation, and stimulates the growth of the hair.)

Two cases were reported.

In the first case, the medicine was given to relieve uraemia consequent upon suppression of urine due to *Chronic Pyelitis*.

The patient was a lady twenty-five years of age, a blonde of petite figure.

The pilocarpin (hydrochlorate) was administered by hypodermic injection, commencing December 16, 1880. and being continued at intervals until February 22, 1881. The usual dose given was one centigram, but on several occasions this dose was doubled.

The object of its use was to eliminate urea from the system by sweating and salivation.

The immediate effect produced was profuse sweating and salivation, calculated to amount to not less than fourteen pints. (See Phila. *Med. Times*, July 2, 1881.)

The result to the patient on each occasion was great exhaustion, but the ureamic symptoms were relieved.

Twenty-two "sweats" were administered in all, and from thirty-five to forty centigrams of *pilocarpin were used*.

CHANGES IN THE COLOR OF THE HAIR.

Specimens of the hair were exhibited to the section, as also a colored plate showing the changes in the color.

Two specimens dated respectively November 1879, and November, 1880, were of a very light color, tinged with yellow, and showed that the color of the hair had not changed during that year.

The third specimen dated January 12, 1881, was a chestnut brown, and the fourth dated May, 1881, almost pure black.

The administration of the Pilocarpin began December 16, 1880, the change was first noticed December 28, 1880, and was thenceforth progressive.

In addition to the change of color the hair has become thicker and coarser than formerly, and while previously dry, is now quite oily.

The hair on other parts of the body is also changed in color.

The eyes have become a much darker blue.

In the second case, the Pilocarpin was administered to an infant fourteen months of age, afflicted with Membraneous Croup. (See Phila. *Medical Times*, August 13, 1881.)

The treatment was commenced June 19, 1881; two milligrams of hydro-chlorate of Pilocarpin being given every hour, afterwards increased to four milligrams every hour. It was administered for nine days, the amount being diminished towards the last.

The first specimen of hair was taken June 17, 1881, and the second June 27, 1881.

The color of the first is light yellow, and the second is a decided shade darker. This effect, of changing the color of the hair, if subsequent experience shall confirm it, adds another to the marvellous influences of Jaborandi on the human system.

The *modus operandi* of the change is still to be determined. It is probably connected with the fact that Jaborandi stimulates the nutrition of the hair.

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* Read before the A. A. A. S., Cincinnati, 1881.

There appears to be reason to believe that the color of the hair is due to an oily pigment, and that this is increased under the influence of Jaborandi.

Shaving the scalp usually has the effect of making the hair thicker and darker, on the contrary, as age advances and the processes of nutrition are enfeebled, the hair becomes thin and dry and whitens.

THE CONSTITUTION OF THE "ATOM" OF SCIENCE.*

By Mrs. A. B. Blackwell, Somerville, N. J.

[Abstract.]

This paper developed the hypothesis that in each atom of matter a given quantity of force and extension are conditioned by each other to act in special modes, rigidly adjusted in time and space. All atoms react against many opposed and unlike forces simultaneously, hence each atom must be a highly complex (not compound), elastic structure, which, by its changes in space, gives the direction, extent, rate of vibration, and all modes and transformations of the atomic force.

We can explain this variety and change of action, if we suppose every atom to alternately expand and contract unlike filaments or poles that act and react in vibrations towards and from a common axis, which is at rest. No point outside this axis can be at rest, except when held in equilibrium by other atoms. Reaction is equal and opposite between every part of the atom, and between it and all other atoms. Chemical combination is the interlocking, the literal intertwisting of certain poles of the combining atoms. Such combination brings to rest, makes latent, the opposed combining poles, wholly or in part; the more completely this is done the greater the transformed motion called heat, and the more stable the compound.

In combining, the uniting poles are massed or knotted, as any intertwisting cords would be, and many-atomed molecules require no extra room for their vibrations; but all gases contain equal numbers of molecules to the volume. But the atomic axes are shifted to a common centre; and thus the vibrations of all the free poles are more or less modified, according to the number and kind of the combining factors; they are always so far modified that the molecules of any compound vapor cannot repel those of either of its constituents, nor those of any unlike vapor—the explanation being that the periods of greatest expansion, the stretch outwards in their free poles are not synchronous. In like molecules they are synchronous, and the free poles, striking at any point short of greatest expansion, drive the atoms asunder. We call them mutually repellant. The action of all repulsive forces will admit of similar explanation. Push or strain in one direction compels counter-push or strain in another direction; hence opposed electricities, magnetisms, and polarization in general.

Gravitation may be considered the concurrent result of brief intertwisting of the physical poles; cohesion and crystalogenic energy represent more permanent interlocking. But chemical and physical combination are supposed to be alike in kind—the result of opposed, adapted mechanical energy. Chemical action in general produces more radical changes in the sensible properties of substances, because, taking the initiative, it sifts the atomic axes, and subsequent combinations are but in accommodation to these previous changes.

The hypothesis attempts to give a fairly adequate explanation of material changes; of the *how* and *why* of such changes.

The unlike elements of matter are supposed to be conditioned in special groups, but are essentially of the same type, and their changes are all in time and space only. There is held to be a higher type of atoms in the living sentient, or "mind matter" group, which we know only through their active organisms. In these atoms, force is conditioned both by extension and by intensiveness, and not in time and space alone—as with simple matter, but in time and space and sentience.

Possible changes in sentience, emotion, may be nascent in these atoms just as complex motion is nascent in all uncombined or but little combined atoms. Complexity of action in molecule and larger mass against which any atom must react in equal measure and opposite directions, compels complexity in the atomic reactions, and in the higher type of atoms one phase of all these reactions represents changes in sentience-sensations, thoughts, volitions.

Molecular complexity sufficient to excite a pleasurable degree of feeling would tend instinctively to repeat itself; hence the rise of organisms. The organism is the sentient atoms everchanging active molecule; and organic growth is adapted to the more and more complex sentient states. Decadence means failure in such adjustments. Sentient changes vary all the way between the low sentient state of profound sleep and the most alert phase of self-consciousness, but they are all individual or atomic changes. This hypothesis claims to offer an explanation of the joint facts both of matter and of mind.

* From the A. A. A. S., Cincinnati, 1881.

BACTERIA AND THEIR RELATIONS TO PLANT CULTURE.

By Thomas Taylor, Microscopist, of the Department of Agriculture.

If we examine, under a high power of the microscope a small portion of the scum of a fermenting infusion of vegetable matter, numerous particles of a globular shape will be observed, measuring about one twenty-thousandth of an inch in diameter, uniform in size and shape, highly refractive and frequently found in gelatinous masses. These are known as micrococci, or spherical bacteria. Associated with them is generally found another description of germs of the same diameter, but of a rod-like shape, jointed and of various lengths. In common vegetable fermenting infusions they are seldom observed over .003 of an inch in length, and are frequently under .001 of an inch. They have generally an active motion, as seen under a high power (as have also the micrococci), and are known as rod-bacteria (from bacterion, a staff). Botanists of the present day assign both of these organisms to the division algæ.

Many investigators believe that certain species of these organisms produce contagious fevers, but there certainly are other species which perform a most useful part in the economy of nature, and in many of our valued industries their active co-operation is absolutely necessary. It is well-known that they are the chief agents of fermentation and putrefaction, and it is to the decomposing power they thus exert, in conjunction with the action of the elements, that all organic bodies decay and restore to the earth soluble fertilizing salts, instead of the insoluble and therefore unavailable material of which, in their unchanged state, they are made up. There is high authority for stating that organic substances are not inherently unstable. Under suitable conditions they may remain for an indefinite period wholly unaltered. It is well-known that in some portions of the earth the carcasses of dead animals tend to dry up and become mummified. In the arctic region the remains of animals imbedded in ice are kept in perfect preservation for centuries. It is only under conditions more or less favorable to the existence and multiplication of the small organisms which produce fermentation and putrefaction that rapid decay takes place.

Without bacterian fermentation the compost heap of

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